

04/14/00



jc780 U.S. PTO

Please type a plus sign (+) inside this box [+]

4-17-00

PTO/SB/05 (12/97)

Approved for use through 09/30/00. OMB 0651-0032

Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

jc715 U.S. PTO

09/549450



04/14/00

UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new non-provisional applications under 37 CFR 1.53(b))

Attorney Docket No. 02556.P033XTotal Pages 2First Named Inventor or Application Identifier Syed Zaeem HosainExpress Mail Label No. EL143556249US**ADDRESS TO: Assistant Commissioner for Patents
Box Patent Application
Washington, D. C. 20231****APPLICATION ELEMENTS**

See MPEP chapter 600 concerning utility patent application contents.

1. X Fee Transmittal Form
(Submit an original, and a duplicate for fee processing)
2. X Specification (Total Pages 49)
(preferred arrangement set forth below)
 - Descriptive Title of the Invention
 - Cross References to Related Applications
 - Statement Regarding Fed sponsored R & D
 - Reference to Microfiche Appendix
 - Background of the Invention
 - Brief Summary of the Invention
 - Brief Description of the Drawings (if filed)
 - Detailed Description
 - Claims
 - Abstract of the Disclosure
3. X Drawings(s) (35 USC 113) (Total Sheets 9)
4. X Oath or Declaration (Total Pages 5)
 - a. Newly Executed (Original or Copy)
 - b. Copy from a Prior Application (37 CFR 1.63(d))
(for Continuation/Divisional with Box 17 completed) (**Note Box 5 below**)
 - i. DELETIONS OF INVENTOR(S) Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).
5. Incorporation By Reference (useable if Box 4b is checked)
The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 4b, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.
6. Microfiche Computer Program (Appendix)
7. Nucleotide and/or Amino Acid Sequence Submission

(if applicable, all necessary)

- a. ☐ Computer Readable Copy
b. ☐ Paper Copy (identical to computer copy)
c. ☐ Statement verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

8. ☒ Assignment Papers (cover sheet & documents(s))
9. ☐ a. 37 CFR 3.73(b) Statement (where there is an assignee)
☐ b. Power of Attorney
10. ☐ English Translation Document (if applicable)
11. ☐ a. Information Disclosure Statement (IDS)/PTO-1449
☐ b. Copies of IDS Citations
12. ☐ Preliminary Amendment
13. ☒ Return Receipt Postcard (MPEP 503) (Should be specifically itemized)
14. ☐ a. Small Entity Statement(s)
☐ b. Statement filed in prior application, Status still proper and desired
15. ☐ Certified Copy of Priority Document(s) (if foreign priority is claimed)
16. Other: _____

17. If a **CONTINUING APPLICATION**, check appropriate box and supply the requisite information:

☐ Continuation ☐ Divisional ☒ Continuation-in-part (CIP)
of prior application No: 09/425,485

18. Correspondence Address

☐ Customer Number or Bar Code Label _____
(Insert Customer No. or Attach Bar Code Label here)
or

☒ Correspondence Address Below

NAME Thomas C. Webster, Reg. No. 46,154
BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

ADDRESS 12400 Wilshire Boulevard
Seventh Floor

CITY Los Angeles STATE California ZIP CODE 90025-1026

Country U.S.A. TELEPHONE (408) 720-8598 FAX (408) 720-9397

02556.P033X

Patent

UNITED STATES PATENT APPLICATION

for

IMPROVED SYSTEM AND METHOD FOR
LOCATING A CELLULAR SERVICE

INVENTOR:

Syed Zaeem Hosain
Robert Fultz
James Sotelo

Prepared by:

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN, LLP
12400 WILSHIRE BOULEVARD
SEVENTH FLOOR
LOS ANGELES, CALIFORNIA 90025
(408) 720-8598

Attorney's Docket No. 02566.P033X

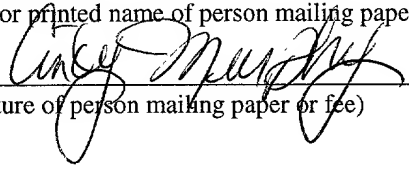
"Express Mail" mailing label number EL143556249US

Date of Deposit April 14, 2000

I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 C.F.R. 1.10 on the date indicated above and is addressed to the Commissioner of Patents and Trademarks, Washington, D.C. 20231.

Cindy Murphy

(typed or printed name of person mailing paper or fee)


(Signature of person mailing paper or fee)

PRIORITY

BACKGROUND OF THE INVENTION

This invention relates generally to the field of mobile and wireless communication systems. More particularly, the invention relates to an improved system and method for locating cellular service in a particular area.

15 CELLULAR NETWORKS

02556.P033X

The mobile station 130 contains a radio frequency ("RF") module (not shown) which allows the mobile station 130 to tune to a particular frequency as designated by the cellular network. The "cell" site is defined by the area (e.g., line 170 in **Figure 1**) surrounding each individual base station 140. In operation, each base station 140-142; 150-151 acts as an interface between the MSCs 110, 115 and the mobile stations 130; transmitting and receiving control and voice signals to and from each, respectively.

The MSCs 110, 115 perform the primary control functions for the cellular network, routing calls between the base stations 140-142; 150-151 and other networks 120 and performing a variety of call management operations (e.g., performing testing and diagnostics; monitoring network traffic . . . etc). Two databases are maintained at the MSCs 110, 115 for tracking cellular subscribers: the home location register (hereinafter "HLR") and the visitor location register (hereinafter "VLR").

Every cellular user belongs to one HLR, which is associated with a particular cellular network service provider. Information relating to the customer's account (e.g., subscribed services, account payments) is stored in the HLR along with customer tracking information which identifies the customer's current location within the overall cellular network (i.e., either within or outside of the subscribed cellular provider's network).

The VLR keeps track of customers who are operating outside of their cellular provider's network. For example, if MSC 110 and MSC 115 were operated by different service providers and mobile station 130 moved outside of a MSC 110's range (where he is a subscriber/user) and into MSC 115's range, then MSC 115 would open a VLR entry for the mobile station 130 and would notify MSC 110 (which would then update its associated HLR for the mobile station 130).

The communication interface between a mobile station 130 and a base station 140 can be broken down into two pairs of channels as illustrated in **Figure 2**: a pair of voice channels and a pair of control channels. The two voice channels, the reverse voice channel ("RVC") 210 and the forward voice channel ("FVC") 220 carry digital or analog voice signals to and from the mobile station, respectively. The two control channels, the reverse control channel ("RECC") 230 and the forward control channel ("FOCC") 240 carry control signals (e.g., the number to dial, the paging signal indicating an incoming call . . . etc) to and from the mobile station 130, respectively. When the voice channels are not in operation, the mobile station 130 must continually monitor its designated control channels for event triggers.

Each cellular service provider broadcasts a unique System Identification Number (hereinafter "SID") on its FOCC within the cellular provider's allocated frequency range. Accordingly, a properly equipped cellular telephone can

determine which service company is providing service on a given channel by identifying the SID. Usually the SID contains three digits.

A AND B CELLULAR FREQUENCY BLOCKS

In the early 1970's, the Federal Communications Commission ("FCC")
5 allocated 40 MHz in the 800 MHz frequency spectrum for the deployment of a
cellular mobile communications system. In 1980, in order to improve
competition, the FCC mandated that two cellular carriers be licensed in each
market. It was the FCC's view that such an approach would provide some
competitive advantages, even though it would not amount to complete market
10 freedom.

Hence, the 40 MHz bandwidth was split into two ranges, labeled "block
A" and "block B" (also known as "band A" and "band B"). Block A was
originally designated for "non-wire-line" companies, i.e., those companies not
engaged in providing traditional telephone service, and block B was designated
15 for "wire-line" companies, i.e., those companies providing traditional wired
telephone service. Each block is operated essentially independently, with
separate systems, cells, equipment, switches, etc. Most cellular devices are
capable of operating in either block, but not simultaneously.

CONTROL CHANNEL PACKET TRANSMISSIONS

The assignee of the present application has developed proprietary, two-way, wireless data communications technologies in which data packets known as Remote Access Application Messages ("RAAM"TM) or Control Channel

5 Application Data ("CCAD"TM) are transmitted over cellular control channels to and from cellular RF modules. See, e.g., U.S. Patent No. 5,845,203 which is assigned to the assignee of the present application. These data packets enable a variety of new applications beyond traditional cellular voice communications, including monitoring and control of remote devices. These new systems operate
10 completely within, and are transparent to, current established cellular networks, without usurping or compromising the voice-based infrastructure and revenue generation.

Problems may occur, however, when RF modules equipped to use the foregoing proprietary technology move from one cellular market to another.

15 More particularly, until both the "block A" and "block B" carriers in all markets select the technology for deployment, there is a natural separation of service availability between the two frequency blocks. In addition, driven by mergers and acquisitions in the Cellular industry, some cellular carriers may support the service on "block A" in some markets and "block B" in others.

20 Since the various RF modules employing this technology must follow normal cellular protocol standards, applications executed on these modules

should be capable of changing the frequency use (i.e., select block A or block B) depending on the market in which they are deployed. For physically fixed devices, it is a relatively simple matter to program a frequency block in which to operate. Mobile RF devices, however, which move from market to market,

5 create a more difficult problem.

For example, mobile devices may move from a market where the only cellular carrier providing the service is available on block B to a market where the only carrier providing the service is available on block A. This necessitates a change in operating frequencies that the RF module uses for service. Moreover,

10 until carriers providing the service are available throughout North America on both A and B blocks, RF modules need to be capable of determining if *neither* carrier in a market provides the service. Conversely, if both block A and block B carriers provide the service, some mechanism should be available for selecting the preferred carrier between the two.

15 Accordingly, what is needed is a system and method for determining the presence of a cellular service in a particular region. What is also needed is a system and method for switching from a first cellular block to a second cellular block when a cellular service has not been detected in the first cellular block.

SUMMARY OF THE INVENTION

A method for determining whether a particular service is provided by a cellular service provider comprising: listening for a page which includes a particular number plan area code ("NPA") in a first frequency block; if the page is not heard in the first frequency block within a specified time period, listening for a page in a second frequency block which includes the particular NPA; and determining that the service is provided in the frequency block in which the page is sensed.

10

BRIEF DESCRIPTION OF THE DRAWINGS

A better understanding of the present invention can be obtained from the following detailed description in conjunction with the following drawings, in which:

5 **FIG. 1** illustrates a typical cellular network.

FIG. 2 illustrates the breakdown of voice channels and control channels on a cellular network.

FIG. 3 illustrates a flowchart which includes elements of the present invention.

10 **FIG. 4** illustrates a flowchart which sets forth additional features of the invention.

FIG. 5 illustrates a flowchart which sets forth additional features of the invention.

15 **FIG. 6** illustrates an exemplary RF device employed in one embodiment of the invention.

DETAILED DESCRIPTION

In the following description, for the purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of the present invention. It will be apparent, however, to one skilled in the art that the present invention may be practiced without some of these specific details. In other instances, well-known structures and devices are shown in block diagram form to avoid obscuring the underlying principles of the present invention.

AN EXEMPLARY HARDWARE/SOFTWARE ARCHITECTURE

Embodiments of the present invention include various steps, which will be described below. The steps may be embodied in machine-executable instructions. The instructions can be used to cause a general-purpose or special-purpose processor to perform certain steps. Alternatively, these steps may be performed by specific hardware components that contain hardwired logic for performing the steps, or by any combination of programmed computer components and custom hardware components.

Elements of the present invention may also be provided as a machine-readable medium for storing the machine-executable instructions. The machine-readable medium may include, but is not limited to, floppy diskettes, optical disks, CD-ROMs, and magneto-optical disks, ROMs, RAMs, EPROMs, EEPROMs, magnet or optical cards, propagation media or other type of media/machine-readable medium suitable for storing electronic instructions.

For example, the present invention may be downloaded as a computer program which may be transferred from a remote computer (e.g., a server) to a requesting computer (e.g., a client) by way of data signals embodied in a carrier wave or other propagation medium via a communication link (e.g., a modem or network connection).

ONE EMBODIMENT OF A SYSTEM AND METHOD FOR LOCATING A CELLULAR SERVICE

An exemplary RF module 600 used to implement elements of the system and method is illustrated in **Figure 6**. The RF module 600 includes a cellular transceiver unit 620 for transmitting and receiving packetized data over cellular control channels. Also illustrated is a processor 610, which may be a Digital Signal Processor ("DSP"), a general purpose processor or a microcontroller, which controls the RF module and executes the cellular processing instructions/logic. A memory section 630 stores one or more RF module programs and parameters, and may also be used to buffer incoming/outgoing data. Other elements of the illustrated embodiment of the RF module 600 include a serial connection for transmitting/receiving data/instructions from external devices; power connections; I/O connections; and additional status pins (e.g., service available flags, multiple channel flags, analog signal strength flags . . . etc).

In one embodiment, RF modules are continually updated to include SID tables which identify markets that provide the service described herein and

markets that do not. In some instances, a complete SID table (i.e., listing of all 2500+ SIDs) is not necessary if the RF module is used in a mobile station with a limited geographical range (e.g., only on the east coast). Limiting the SID table in this manner will help to save memory for other applications in the RF module.

SID Table Search

An RF module may use the SID tables to determine whether to use block A or block B in a particular cellular market by performing the process illustrated in **Figure 3**. At step 310, the RF module enters a new market (or is powered up in a new market) and hears a new SID broadcast over the air on the FOCC at step 315. If this new SID is different from the previous SID, the application looks up the SID in its stored SID tables. If the new received SID is in the table (a determination made at step 320), the market provides the service and the process is complete (step 325).

If the new SID is not in the table, however, the application switches the RF module to the alternative frequency block (block A or block B) at step 330 and listens to the SID on that block at step 335. If the other block has a SID that is in the table (step 340), then once again, the process is complete (step 345).

If the other SID is also not in the table, the RF module application must make a decision as to how urgently it “needs to know” whether a local cellular carrier provides the service (step 350). If the “need to know” is not urgent, then

the RF module will enter the search process at step 510 in **Figure 5**. If the search algorithm fails, then the RF module will enter a “beacon” mode as described in detail below. If, however, the “need to know” is urgent, then the RF module application enters an “urgent” process starting at 410 in **Figure 4**.

Urgent System and Method

The “urgent” system and method is used in situations where the RF device must determine service capability as quickly as possible (i.e., where the “search” and “beacon” processes described below are not timely enough). In one embodiment, this process consumes at least two data packet transmissions—both a reverse data transmission (RECC channel) and a forward cellular page (FOCC channel). The process may transmit/receive packets at a faster rate depending on the distance covered by the mobile RF device through multiple SID changes. However, the RF module application may be programmed to intelligently choose to invoke this process, i.e., only invoking it when a serious exception has occurred (e.g., vehicle theft). This process may be useful in an embodiment where service charges from the cellular carriers are based on packet transmissions.

Starting at step 410, the mobile RF device sends a packet to a host computer (the “host”) requesting a response from the host, specifically, a cellular page acknowledging the packet. The host computer may be maintained by the organization employing the system and method described herein and may be

continually updated to include a current list of SIDs for cellular carriers which provide the service. In one embodiment, communication between the RF module and host occur across a network such as network 120 of **Figure 1**. If the mobile RF device is in a market which provides the service, the host will receive the request packet and will send a cellular page response back (i.e., to the cellular provider), resulting in a page to the mobile unit (i.e., over the FOCC).

After the mobile device transmits a packet/page request, it waits for a response (step 415). The wait time may be adjusted within the RF device based on the particular application for which the device is being used. In any case, a wait time should be long enough to ensure that the packet has the time to traverse the network—both ways—and be processed by the host. If the mobile device receives a response, then it is in a market which provides the service and it is “done” (step 425). The RF device (i.e., the application running in the device) updates its SID table accordingly so that it does not need to run the “urgent” process again the next time it enters the market.

If a response is not received in the predetermined time period, the RF device switches to the alternative frequency block (step 430) and sends another packet requesting a response from the host (step 435). Once again, if the mobile device receives a response to the second transmission, it is “done” (step 450) and the mobile unit’s software and/or firmware (or any combination thereof) should update the SID table accordingly.

If a response is not received to the second transmission, the device is not in a market which provides the service (step 455). As such, the RF module application must use other means to send the data or store it for a future transmission time when coverage is available.

5

Search System and Method

Under normal operation, one embodiment of an RF module 600 listens for cellular pages sent in a predetermined Number Plan Area ("NPA") range. An NPA value represents an area code when used by a traditional cellular phone. In one embodiment of the present system and method, however, an NPA value is selected which is not an area code assigned to any location in the United States. Accordingly, detecting this predetermined NPA value identifies the data associated therewith to the present system and method.

One specific embodiment uses an NPA value of 175. Accordingly, when an RF module hears a page using an NPA value of 175, even if it is directed to another RF device, it reports that it has entered a market which provides the service (i.e., because the 175 NPA page would not have occurred unless the device was in such a market). This report can be used by the mobile unit's application software/firmware to update the SID table entry associated with that market.

It should be noted that some RF modules may be equipped to only hear either even or odd incoming pages, matching their programmed mobile identification numbers (“MINs”) of which the NPA is a component. Therefore, if this type of an RF module has an odd MIN, it can only listen to incoming pages to other odd MINs.

In one embodiment, the RF modules contain firmware and/or software which directs the RF module to switch between block A and block B, using a pre-determined “listen” time (e.g., 15 minutes per block) during which the RF module listens for NPA 175 pages in each block. In addition, the search on block A and block B can be controlled directly by an application running the host over the data interface (i.e., across network 120) to the RF module. This embodiment may provide more precise control of the search timing—particularly if the application wants to intelligently check one frequency block for a longer time than the other frequency block.

Referring to **Figure 5**, in the “search” process, the RF module notes the SID (indicating a new market) at step 510 and listens for pages sent to any 175 NPA (even or odd), including pages to other devices (step 520). If, in a pre-determined period (e.g., 15 minutes), it hears such a page, it reports the service availability and the process is “done” (at step 530). The mobile unit’s firmware and/or software updates the SID table accordingly. If the timer expires without

hearing such a page (determined at step 535), it switches to the other frequency block (step 540) and listens for even or odd pages to the 175 NPA (step 545).

If, in the other block, it hears a page, it reports the service availability and the algorithm is "done" (step 555) and the mobile unit's firmware and/or software updates the SID table accordingly. If the device still does not hear a page, however, it must decide whether to continue searching by switching back and forth between the frequency blocks, or terminating the search. If the search is terminated, the device may either use alternative means to send the data, store the data for a future transmission, or enter the "beacon" process (described below).

It is important to note that the effectiveness of the "search" process is directly related to the number of RF devices employing the system and method described herein. On any given SID there may only be a few units available and many of them may be off and/or not sending/receiving data. Therefore, during the initial period of service deployment the "search" process may be limited. However, as more RF units are deployed, the "search" process may provide the best mechanism for updating SID tables for non-critical situations.

Another embodiment of a search process is illustrated in **Figure 7**. At step 705 the RF module notes the SID indicating a new market and, at step 710, listens for pages sent to any 175 NPA (even or odd), including pages to other devices.

If, in a pre-determined period (e.g., 15 minutes), it hears such a page (at 715), it then determines whether the *type* of page which was heard (at 720). Specifically, in one embodiment, the RF module is capable of distinguishing between commercial pages, indicating that service is available, and test and/or negative pages, indicating that service is not available. These test/negative pages may accompany normal pages, and may be generated by the organization employing the system and method described herein. One such type of page is described below as a Negative Beacon, or NEGBEACON, page. If it is determined at 720 that the page was not a test/negative page (and/or was not accompanied by a test/negative page) then at 725 the process is complete and the RF module updates it's SID tables accordingly.

If the RF module does not hear a page for a predetermined period of time at 717, or if the RF module hears a negative page at 720, then at 735, it switches to the other frequency block and listens for even or odd pages to the 175 NPA. If, at 745, it hears a page, it then determines, at 750, whether the page was a test/negative page or was accompanied by a test/negative page. If so, the RF module determines that it is not in a commercial market (at 755) and the process is complete. In an alternative embodiment (not shown in **Figure 7**) the RF module may switch back to the original frequency block if it did not previously hear a test/negative page in that block (i.e., if it arrived at 735 from decision block 717, and not 730). If, however, the page heard by the RF module was not a test/negative page (and/or was not accompanied by a test/negative page) then,

at 725, the module concludes that it is in a commercial service and updates its
SID tables.

If the RF module does not hear a page at 745, and if the timer is still active
(determined at 747), it continues listening in the frequency block. If, however,
5 the period of time in the frequency band has elapsed it determines whether it
should continue checking at 749 (i.e., based on how it is programmed). This
decision may be based on whether (and how many previous times) the RF
module has listened for pages in the different frequency blocks. If the decision is
to continue checking, the module switches to the alternate frequency block at
10 735; if not, it determines that no service is available at 760.

Beacon System and Method

Recognizing that, in some instances (e.g., the early days of deployment),
the “search” system and method may not yield consistent results, an additional
system and method may be used to determine service coverage. These include
15 the network request beacon page; the network recurring beacon page; and the
network exception beacon page.

Network Request Beacon Page. In one embodiment, the packet format of
fifteen 9s (“99999999999999”) is reserved for the Dialed Digits data field of the
packet as a means for the mobile unit to request the service network (e.g., the
20 host) to send a beacon page (i.e., format 175-xxx-xxxx) to its current SID. This

encoding is not likely to be seen in standard cellular transmissions (e.g., in a mobile GPS-based application).

The service provider (i.e., the organization providing the system and method described herein) may set restrictions on usage of the "beacon" feature.

5 For example, in one embodiment, a beacon request is provided at no charge *only* if the mobile unit is configured with a SID table with a minimum number of entries (e.g., 700) and/or performs at least one "search" process cycle and/or updates its SID table after the receipt of the network beacon page once a service determination is made (i.e., such that it no longer needs to send the specially
10 formatted packet when it later reenters that same market).

In one embodiment, the service provider responds to the network request beacon pages at predetermined time periods (e.g., on the quarter hour in which the request was received).

Network Recurring Beacon Page. Using this method, the service provider
15 sends a beacon page (175-xxx-xxxx) to all SIDs that have been added to the service provider's coverage area after the initial SID table definition. Using this method, the service provider may choose not to send a beacon page to *all* SIDs on the list.

Network Exception Beacon Page. A third method, network exception beacon
20 page, continually monitors service traffic in each SID and, if no page has been

sent to a SID in a predetermined time period (e.g., 14 minutes) where there is an RF module newly registered, it automatically sends a beacon page (format 175-xxx-xxxx) to that SID.

Types of Coverage Beacon Pages. As described briefly above, embodiments of the invention may include different beacon page types: positive beacons ("POSBEACONS") and negative beacons ("NEGBEACON"). A positive beacon is a forward page which tells the RF module that commercial service is available. It includes a known NPA (as described above) which is a component of a MIN. Because some RF modules may be equipped to only hear either even or odd incoming pages, matching their programmed MINs, two types of beacon pages may be implemented: odd beacon pages (e.g., 175-989-9999) and even beacon pages (e.g., 175-989-9998).

A NEGBEACON is a forward page that indicates the unavailability of commercial service in the particular frequency band in which it is heard. This may mean that the cellular market has non-commercial coverage or test coverage. Non-commercial coverage may mean that the broadcast SID ("BSID") is undergoing commercialization but has not yet been fully certified as commercial (e.g., the installation of the system and method may be in progress or the installation may be complete but commercial designation is pending during final network testing).

Test markets (which may be identified as such in the SID Table) are markets in which service is available for engineering tests, cellular carrier evaluations and limited Developer use, but not for use by Application Developers with commercial Applications.

5 In one embodiment, in test and other non-commercial markets where normal pages might otherwise be misinterpreted as POSBEACON pages, a NEGBEACON will be sent at or about the same time as the normal page (e.g., within 30 seconds) to indicate that the market is non-commercial.

Coverage Determination Request. A Coverage Request according to one
10 embodiment is a specially formatted reverse data packet sent from a commercially certified RF module to request a coverage determination response from the organization employing the system and method described herein. One embodiment of a process for making a coverage determination is illustrated in **Figure 9**. At 910, the RF module broadcasts a coverage determination request.

15 The coverage determination request packet may be a reserved data format which is highly unlikely to be used for other applications (e.g., a * followed by fifteen 9s).

If the RF module hears a response page (determined at 915) the RF module then determines whether it was a NEGBEACON response and/or
20 whether a NEGBEACON response was heard in addition to the response page

(step 945). If not, then the RF module determines that it is in a commercial service area and updates its SID table accordingly (at 955). If a NEGBEACON page was heard, however, the RF module switches to the alternate frequency block (step 925) if the other frequency block has yet to be checked (determined at 5 950), or alternatively determines that the RF module is in a test area (at 970) if the other frequency block has been previously checked. If the RF module spends a predetermined amount of time checking both frequency blocks and receives no response, then it determines that no service is available in the area (at 960).

As described above, the response page may be in the form of a 10 POSBEACON or a NEGBEACON, depending on whether service is available. Because a market may have coverage available for test and commercial purposes, the table illustrated in **Figure 8** identifies a plurality of responses to a coverage determination request.

In one embodiment, the coverage determination request capability, and 15 the appropriate response, is available at no charge as long as the RF device and the application running thereon has been certified as meeting certain minimum standards. These standards may include, for example, that the RF device has a SID table with a minimum number of entries; updates a BSID entry to be valid for a minimum of 1 year, after receipt of a POSBEACON; makes a maximum 20 number of successful requests within a time period from the same BSID; uses a real time clock that maintains an accuracy of ± 1 minute over its specified; and/or

has a temperature range for the maximum time allowed between updates (e.g., using GPS, if available).

Once an RF module has positively determined that commercial service is available, it should store the SID in its SID Table such that it no longer needs to send the specially-formatted packet when it later re-enters that same commercial BSID. In one embodiment, the organization employing the system and method will bill organizations/individuals using the system for each POSBEACON sent in response to each coverage determination request after a maximum number per year (e.g., with a rolling one year window) made from the same MIN in the same commercial BSID. In one embodiment, only coverage determination requests made from the same commercial BSIDs will count against the per year maximum. In addition, requests made from BSIDs with test or non-commercial service may not be counted as long as the reasonable discretion is used in making such requests (for example, no more than one per day).

Coverage Determination Request Response Timing. In one embodiment, the organization implementing the system and method described herein will respond to coverage determination requests with a POSBEACON or NEGBEACON page on the quarter hour (or other fraction of the hour) in which the request was received: (e.g., HH:15, HH:30, HH:45, HH:00, universal time coordinates ("UTC")) for requests received from the A-block, and 7.5 minutes later (HH:07:30, HH:22:30, HH:37:30, HH:52:30) UTC for requests received from

the B-block. However, in one embodiment, if a 175-XXX-XXXX forward page is sent after the request is received and before the POSBEACON forward page would have normally been sent (A- or B-block), another POSBEACON forward page will not be sent at the specified time. This is because a normal forward
5 page anytime during that interval effectively performs the same function as the POSBEACON. Accordingly, in this embodiment the application may stay on and listen for forward pages during the interval from the time a coverage request is made until a few minutes after the normal time (A- or B-block) when the POSBEACON page is due (i.e., an RF module should not make a coverage
10 determination request and then turn off until a few minutes before the next scheduled beacon time).

Different policies may be applied to battery operated modules. For example, battery operated modules may be configured to wake up slightly more than a few minutes before normally scheduled beacon times to make a coverage
15 determination request, and listen until a few minutes after the normally scheduled beacon time, or shortly after hearing a forward page sent to 175-XXX-XXXX. The RF module application in one embodiment should stay on an additional quarter hour to hear a response if the request is sent within a few minutes before the normally scheduled beacon time and should stay awake until
20 a few minutes after the time it expects to hear a response. If an intervening forward page to another RF device is sent (without an accompanying NEGBEACON page), then the RF module may stop listening at that point

without waiting for the next quarter hours since the normal page will be deemed a POSBEACON.

In one embodiment, if a request is received within one minute of any normal beacon time, the organization implementing the system and method described herein will delay sending the beacon response until the next normal beacon time. In a test service area it is possible that a 175-XXX-XXXX forward page will be sent while the RF module application is listening for a 175-XXX-XXXX forward page in search mode or is listening for a response to a coverage determination request. In test and non-commercial areas all forward pages may be followed by a NEGBEACON. Therefore, when using the search or beacon algorithms, upon receipt of a normal forward page (treated as a POSBEACON), the RF module application should wait for a short period (e.g., 30 seconds) before deciding if the service area is commercial or test/non-commercial.

Recurring POSBEACON for New Commercial BSIDs. Once a day (e.g., at 09:00UTC if the market is on the A-block; and 09:30UTC if the market is on the B-block), the organization employing the system and method described herein will send a POSBEACON forward page to new markets that have achieved commercial status since the last quarterly SID table update. In one embodiment, two POSBEACON forward pages will be sent to each market at the specified time, addressed to the selected even and odd MINs (e.g., MINs 175-989-9998 and 175-989-9999), unless a forward page to a 175-XXX-XXXX MIN is sent as a

substitute during the middle eight minutes of the POSBEACON time window
(see next paragraph) of 12 minutes.

In one embodiment, an RF module application desiring to hear this
POSBEACON should turn on shortly (e.g., 6 minutes) prior to the scheduled time
5 (08:54UTC on the A-block and 09:24UTC on the B-block) and stay on till shortly
(e.g., 6 minutes) after the scheduled time (09:06UTC on the A-block and
09:36UTC on the B-block). To account for clock skews between the Application
and the HLR of the organization implementing the system, only a forward page
to a 175-XXX-XXXX MIN will be considered a substitute if it occurs a few
10 minutes before or after the scheduled POSBEACON times (9:00UTC and
9:30UTC). The POSBEACON forward pages will only be sent to a new market
for a predetermine time period (e.g., 180 days) after its achieving commercial
status. At that time, RF modules entering that BSID must rely on other
algorithms for determining coverage.

15 *Monthly Beacons.* In addition to the Coverage Determination Request and
recurring POSBEACON for new commercial markets, in one embodiment
monthly beacon sequences may also be used to make changes to RF devices' SID
tables on-the-fly. The sequences may be sent to all A-block markets at one time
(e.g., starting at 10:00UTC) on the first day of each month; and to all B-block
20 markets at another time (e.g., starting at 10:30UTC) on the first day of each
month.

Different types of monthly beacons may be implemented. In one embodiment, beacon types include SIDADD, SIDREMOVE, SIDSHAREADD, SIDSHAREREMOVE, and SIDNULL, each of which are described in detail below. Each of the different beacon types may be sent in a predetermined order.

5 In one particular embodiment, the order is SIDADD (if any), SIDREMOVE (if any), SIDSHAREADD (if any), and SIDSHAREREMOVE (if any). For example, if the current month includes two BSIDs to be added to coverage, but no BSIDs are being removed from coverage, identified as shared, or removed as shared, then the monthly beacon sequences for that month will start with and consist of two
10 SIDADD beacon sequences only. Likewise, for example, if the current month includes only one SIDSHAREREMOVE, then the monthly beacon sequence for that month will start with and consist of only a single SIDSHAREREMOVE beacon sequence. If there are no other beacon sequences for any given month, then two SIDNULL beacon pages will be sent.

15 In one embodiment, the SIDADD beacon sequence consists of two forward pages (SIDADD1 and SIDADD2) sent to all A-block markets that have coverage and all B-block markets that have coverage. Note that four forward pages (two two-forward-page sequences) will actually be sent into each market area for each block: the first two-page sequence that can be heard by RF devices
20 with odd-numbered primary MINs and the second two-page sequence that can be heard by RF devices with even-numbered primary MINs. The SIDADD

beacon sequences may be part of the monthly beacon sequences sent to all markets once a month.

As an example, an RF device with Primary MIN 175-421-1234 (even numbered) is located in BSID 41 (odd numbered—therefore A-block). The organization implementing the system and method will notify its application developers (i.e., those developing applications for the RF device) that BSID 37 has been added to commercial service. An RF device with Primary MIN 175-421-1234 must listen (wake up if in sleep mode) for the SIDADD beacon sequence during a particular time period (e.g., from 9:54UTC to 10:06UTC) on the first day of the month. During that time, the following BEACON sequence (which can be received in either order) will be broadcast into all markets: Page to 175-989-8002 (SIDADD1); Page to 175-989-0376 (SIDADD2).

In the event that a BSID carrier decides to cease providing coverage, a special SIDREMOVE beacon may be transmitted to all markets for a specified time period (e.g., once a month for up to 6 months before the actual termination date and for 3 months after the actual termination date), following notification to the application developer (using the SID Table update process) that the BSID is being deleted from coverage.

A BSID can be removed in a situation where coverage will not be impacted. Occasionally, a carrier will decide to consolidate BSIDs in order to

achieve a larger local calling area for their voice services. When that happens, one or more BSIDs may be removed from the network and replaced with another BSID—which is typically already in place. The SIDREMOVE beacon may be used in this situation as well.

5 The SIDREMOVE beacon sequence may consist of two forward pages (SIDREMOVE1 and SIDREMOVE2) sent to all A-block markets that have coverage and all B-block markets that have coverage. Note that four forward pages (two two-forward-page sequences) will actually be sent into each market area for each block: the first two-page sequence that can be heard by RF devices
10 with odd-numbered Primary MINs and the second two-page sequence that can be heard by Devices with even-numbered Primary MINs. The SIDREMOVE beacon sequences may be part of the monthly beacon sequences sent to all markets once a month.

 For various reasons—primarily to create larger “home” calling areas—
15 some carriers have banded together to form “virtual carriers” in selected markets. This activity has resulted in a number of BSIDs that are shared between carriers. This results in a situation where part of the BSID area does not provide coverage since it is covered by one carrier; and part of the BSID area does provide coverage since is covered by a second carrier.

To address this issue, SID tables may include a SHARED SID flag: when TRUE, a BSID is shared by a carrier and a non-carrier, which means that the BSID has coverage only in selected areas of its footprint; when FALSE, a BSID is unique for one carrier OR is shared between two carriers, which means that the
5 BSID has coverage everywhere in its footprint.

While the SID tables may be updated with a field that identifies a Shared Broadcast SID (or not), the cellular marketplace is very dynamic. It is possible that other market areas will strike shared SID agreements in the future.

Therefore, one embodiment of the system and method provides a mechanism for
10 dynamically identifying newly identified Shared BSIDs via the SIDSHAREADD beacon sequence. This beacon sequence will be sent to all markets (e.g., once per month for the 3 months) following notification to the application developer that the BSID is a Shared BSID.

Likewise, as coverage for the present system and method is expanded, it is
15 entirely likely that a shared SID situation will be resolved by the inclusion of certain carriers into the coverage footprint. Therefore, one embodiment will also provide a mechanism for dynamically identifying BSIDs that are no longer shared via the SIDSHAREREMOVE beacon sequence (i.e., in the event that coverage is available everywhere in its footprint). This beacon sequence may be
20 sent to all markets (e.g., once per month for the 3 months) following notification

to the RF application developer (e.g., using the SID table update process) that the BSID is no longer a Shared BSID.

In one embodiment, the SIDSHAREADD beacon sequence consists of two forward pages (SIDSHAREADD1 and SIDSHAREADD2), sent to all A-block
5 markets that have coverage and all B-block markets that have coverage. Note that four forward pages (two two-forward-page sequences) will actually be sent into each market area for each block: the first two-page sequence that can be heard by RF devices with odd-numbered primary MINs and the second two-page sequence that can be heard by RF devices with even-numbered primary
10 MINs.

Likewise, The SIDSHAREREMOVE beacon sequence may consist of two forward pages (SIDSHAREREMOVE1 and SIDSHAREREMOVE2) sent to all A-block markets that have coverage and all B-block markets that have coverage. Note that four forward pages (two two-forward-page sequences) will actually be
15 sent into each market area for each block: the first two-page sequence that can be heard by RF devices with odd-numbered primary MINs and the second two-page sequence that can be heard by RF devices with even-numbered primary MINs.

It is possible that there will be no beacon sequences in any given month.
20 To reduce the time an RF device might decide to wait to hear a beacon sequence,

one embodiment of the system and method includes a SIDNULL beacon page. The SIDNULL beacon is a single-forward-page sent to all A-block markets that have coverage and all B-block markets that have coverage. Note that two forward pages may actually be sent into each market area for each block: the first page can be heard by RF devices with odd-numbered primary MINs and the second page can be heard by RF devices with even-numbered primary MINs. The SIDNULL beacon page will replace the normal SIDADD, SIDREMOVE, SIDSHAREADD and SIDSHAREREMOVE sequences sent to all markets once a month if necessary.

Exemplary Min Masks for SID Table Updates

In one embodiment it is the responsibility of the RF module application to perform URGENT, SEARCH, and BEACON (including SIDADD, SIDREMOVE, SIDSHAREADD and SIDSHAREREMOVE BEACONS) algorithms. When the application uses the SEARCH and BEACON algorithms, then two (of the nine available) Secondary MIN masks MAY be used for SID table updates: Mask 8 may be set to wildcard MIN 175-989-AAAA; Mask 9 may be set to wildcard MIN 175-AAA-AAAA. This mask may be used if the RF device's coverage determination algorithms are not used or are unavailable. Otherwise, the RF device, and not the application, can search for any forward page to 175-XXX-XXXX, indicating service availability.

In one embodiment, a forward page match to wildcard Mask 8 with 175-989-999(8/9) reported indicates the occurrence of a POSBEACON and the presence of commercial service. A forward page match to wildcard Mask 8 with 175-989-999(0/1) reported indicates the occurrence of a NEGBEACON and the presence of test (or non-commercial) Micro-Burst service.

In one embodiment, a forward page match to Mask 9 indicates service. If a NEGBEACON then occurs within a predetermined time period (e.g., 30 seconds), then it is test (or non-commercial) service area. However, if no NEGBEACON occurs after this time period, then it is commercial service area.

Min masks may also be employed with respect to the various beacon pages described above (e.g., SIDADD, SIDREMOVE, SIDSHAREADD and SIDSHAREREMOVE).

SID Table Management

SID tables must be managed (e.g., updated) after the mobile device is deployed in the field. In particular, table management rules and methods may be incorporated in the RF device application program (e.g., based on the needs and available host processor power and/or data storage capacity) to ensure that the tables are accurate.

As mentioned earlier, when a device makes a "successful" service determination (e.g., the process is "done"), it may use the information to store

and/or update the corresponding entry in the SID table. In one embodiment of the system and method, the module application program may also choose to use a “failed” service determination (e.g., particularly when using the “urgent” algorithm) to discard or invalidate out-of-date entries in the table.

5 *Number of SID Table Entries.* The first item to be considered for table management is the number of entries in the SID table. Storing every SID in the North American continent (about 2500 SIDs) is probably not necessary (depending on the application) and consumes a substantial amount of memory. Application developers should instead examine the specific application needs
10 and balance those needs against production and installation requirements. For example, if the application is intended for a regional truck dispatch the device is likely to stay in the same market for extended periods. By contrast, if the device is operated in trucks in the long haul trucking industry, the device may move through 10 markets in a single day. Similarly, an application device may be
15 constrained to only move in certain regions (e.g., mounted on a railway engine). This limits the number of SID values to which it is likely to be exposed during normal operation.

In essence, the application developer may choose to determine how many SID numbers the mobile device is likely to “hear” during normal operation and
20 plan accordingly—with room for expansion based on the needs of the

application. As described above, a shared SID Flag (e.g., 1 = shared; 0 =not shared) may be included in the SID Table.

Unlike the United States, the two Canadian cellular carriers (one for the A-block and one for the B-block) provide nationwide coverage. There is no concept of MSAs/RSAs in Canada for this reason. This true duopoly situation simplifies the coverage determination algorithm for Canada. One embodiment of the system will operate on one of the two frequency blocks in Canada, e.g., the A-block. Therefore, if an RF application sees a BSID in the range of 16384 through 18431 (inclusive) that is odd-numbered, then that BSID has available service. The use of additional algorithms may not be necessary. An SID table note accompanying each SID Table release will include a specific note on the availability of Canadian coverage, although the SID table will not include each Canadian BSID.

In the event that service is discontinued in Canada, a SIDREMOVE beacon page will be sent to “remove” BSID 16385. While this BSID may not actually be in the SID Table, it is serving as a proxy for Canadian service. The Application should interpret this SIDREMOVE beacon sequence as an instruction to discontinue the use of the Canadian algorithm described above, that is, service is being discontinued from all odd numbered BSIDs between 16384 and 18431 (inclusive). For example, assume Canadian service is to be discontinued in 6 months. Devices with even numbered primary MINs would see the following

broadcast at 10:00UTC on the A-block on the first day of the month:

SIDREMOVE1 = Page to 175-989-6162; SIDREMOVE2 = Page to 175-989-3856.

Another reason for the RF application to use this algorithm for coverage determination in Canada is that the Canadian cellular carrier is constantly
5 changing the BSID numbers broadcast into their markets. This dynamic environment does not enable accurate SID table entries to be maintained for Canada (at this time).

The Mexican cellular environment is a hybrid of the U.S. and Canada. Mexico is segmented into nine market areas. On the A-block, there are multiple
10 companies providing service for one or more of these nine market. On the B-block, there is only one carrier for the entire country. In one embodiment, the system and method described herein will be employed on the B-block. In this embodiment, at least two strategies may be applied for future coverage determination in Mexico: If the Application sees a BSID in the range of 24576
15 through 25599 (inclusive) that is even-numbered, then that BSID has coverage. The use of additional algorithms is not necessary.

The SID Table has specific Broadcast SID entries for each market area in Mexico. Mexican BSID entries may be handled in a similar manner to U.S. BSID entries. If service is discontinued in Mexico, appropriate SIDREMOVE pages
20 may be sent to remove BSID 24576. The RF application should interpret this

SIDREMOVE sequence as an instruction to assume service is being discontinued from all even numbered BSIDs between 24576 and 25599 (inclusive). For example, assume Mexican service is to be discontinued in 6 months. Devices with even numbered primary MINs might see the following broadcast at 10:00UTC on the A-side Carriers on the first day of the month: SIDREMOVE1 = Page to 175-989-6242; SIDREMOVE2 = Page to 175-989-5766.

Maximum Table Entries. Notwithstanding the above discussion, if the application has the capacity and the service provider provides sufficient storage capacity, a minimum level of SID entries may be required (e.g., 700 SID entries).

In one embodiment, use of the “beacon” page function (described in detail above) may be conditioned upon a minimum number of SID table entries.

Entry Lifetimes. This feature is particularly relevant for SID tables that do not implement a comprehensive set of SID table entries (e.g., covering a footprint for the U.S. and Canada). It is most useful for phasing out SIDs that do not get used very often versus those that do. This feature may also be referred to as “caching” of SID table entries.

In this embodiment, a “time-to-live” (“TTL”) value for each SID table entry is recorded and continually updated. This TTL value should not be too short or too long. If too short, the need for validating SID table entries on a more frequent basis is increased. If too long, the application may find invalid entries

in the SID table and unsuccessfully attempt service transmissions in a market where service is not available.

A reasonable value for a SID entry TTL is probably one or two years for most applications. This provides a reasonable balance between the update and
5 the possibility of inaccuracies.

SID Entry Match Count. This feature is also particularly relevant for SID tables that do not include a comprehensive set of SID entries. The RF module application program records the number of successful SID matches (“hits”) when service is determined, along with the TTL.

10 Such a “match count” is increased every time the SID is matched by a successful service determination and improves the “quality” of the entry. Then a TTL expiry decreases the hit count rather than deleting the SID entry entirely. This allows the mobile device to spend longer periods in a region, with occasional larger moves in between (such as might be experienced by a rental or
15 leased vehicle).

The hit count can also have maximums to prevent gross errors. Moreover, the TTL value can be reduced since the entries are validated more granularly. A balance between the hit count maximum and the size of the TTL can be set to ensure that the table entries are not invalidated too quickly. The initial value of

the hit count can be set to a known state that allows the device to “settle in” over time.

The application may also choose to use a service determination failure to reduce the hit count more dramatically than a TTL expiry. For example, if an
5 “urgent” algorithm fails, the hit count may be reduced to zero.

In short, the overhead of extra storage associated with keeping a hit count is more than offset by the improvement in the quality of the SID table entry and the resulting ease in determining the availability of service.

SID Entry States. If hit counts are not used, and the full SID list is included
10 in memory, each entry may be tagged with multiple known states such as “Active,” “Contracted,” and/or “Not Contracted.” In this embodiment, the multiple states may then be used to make decisions regarding whether to try the “urgent” process or not.

SID Entry Intelligent Grouping. For particular applications (e.g., geo-
15 fencing or auto-theft applications), nearby SIDs can be grouped with the most actively used SID (e.g., including using hit counts). This embodiment allows quicker switching to the correct frequency block carrier, for example, in the event a vehicle is stolen. Using this embodiment, the vehicle will be ready to transmit data immediately when moving from one adjacent market to another. This
20 feature is not strictly necessary if the SID table is large enough to incorporate all

the known SID values, but can nonetheless be helpful in determining a match in the data more rapidly.

The SID table operations may be uniquely tailored to the needs of each customer. For example, in long-haul trucking applications, the SID transitions for typical routes can be recorded and improved over time (again using the concept of hit counts). This allows predictive switching from one frequency block to the other, as the vehicle moves, and minimizes the time the device is not set to transmit data successfully. Once again, this feature is particularly useful if insufficient storage has been provided to store the entire SID table list.

Over-The-Air Updates. In many applications, the mobile device may also incorporate a traditional voice cellular unit and/or a traditional data modem. In this embodiment, the modem and cellular voice service may be used to connect to the mobile device and update the SID tables "over-the-air." This embodiment allows the entries to be validated once the RF device is deployed in the field without requiring it to be brought in for service.

Throughout the foregoing description, for the purposes of explanation, numerous specific details were set forth in order to provide a thorough understanding of the invention. It will be apparent, however, to one skilled in the art that the invention may be practiced without some of these specific details. For example, although described in the context of a system which uses cellular

control channels to transmit packetized data, the underlying invention is not limited to such a system. Accordingly, the scope and spirit of the invention should be judged in terms of the claims which follow.

02556.P033X

CLAIMS

What is claimed is:

1 1. A method for determining whether a particular service is provided by
2 a cellular service provider comprising:

3 listening for a page which includes a particular number plan area code
4 (“NPA”) in a first frequency block;

5 if said page is not heard in said first frequency block within a specified
6 time period, listening for a page in a second frequency block which includes said
7 particular NPA; and

8 determining that said service is provided in said frequency block in which
9 said page is sensed.

1 2. The method as in claim 1 further comprising:

2 upon sensing said page in either said first or said second frequency band,
3 listening for a negative page within a time period following sensing said page,
4 said negative page indicating that said service is not supported in said frequency
5 band in which it is sensed.

1 3. The method as in claim 1 further comprising:

2 wherein upon hearing a negative page in said first frequency block,
3 switching to said second frequency block and listening for a page which includes
4 said NPA.

1 4. The method as in claim 1 further comprising:
2 upon determining that said service is supported, updating a system
3 identification ("SID") table to include a SID value identifying said cellular service
4 provider.

1 5. The method as in claim 1 wherein said NPA is not used as an area
2 code in any cellular market.

1 6. The method as in claim 1 further comprising:
2 transmitting a coverage determination packet requesting a page in said
3 first frequency block.

1 7. The method as in claim 6 further comprising:
2 upon receiving a page responsive to said coverage determination packet,
3 determining whether said page is a negative page indicating that said particular
4 service is not provided in said first frequency block.

1 8. The method as in claim 6 further comprising:
2 upon receiving a page responsive to said coverage determination packet,
3 listening for a negative page for a specified time period, said negative page
4 indicating that said particular service is not provided in said first frequency
5 block.

1 9. The method as in claim 8 further comprising:
2 updating a system identification ("SID") table to include a SID value
3 identifying said cellular service provider upon sensing said page and not sensing
4 a negative page.

4 indicating that said particular service is not provided in said first frequency
5 block.

1 16. The method as in claim 15 further comprising:
2 transmitting a second network request beacon page in a second frequency
3 block responsive to receiving a negative page in said first frequency block; and
4 listening for a network beacon page indicating that said service is
5 provided in said second frequency block.

1 17. The method as in claim 10 further comprising:
2 updating a system identification ("SID") table to include a SID value
3 identifying a cellular service provider in said market upon sensing said network
4 beacon page.

1 18. An RF module comprising:
2 a processor;
3 a memory for storing instructions which, when executed by said
4 processor, cause said processor to perform:
5 transmitting a network beacon page request in a first frequency block; and
6 listening for a network beacon page indicating that said service is
7 provided.

1 19. The RF module as in claim 18 further including instructions which,
2 when executed by said processor, cause said processor to additionally perform:
3 determining that said service is provided upon hearing said network
4 beacon page.

5 listening for a network beacon page indicating that said service is
6 provided in said second frequency block.

1 25. The RF module as in claim 10 further including instructions which,
2 when executed by said processor, cause said processor to additionally perform:
3 updating a system identification ("SID") table to include a SID value
4 identifying a cellular service provider in said market upon sensing said network
5 beacon page.

TCW

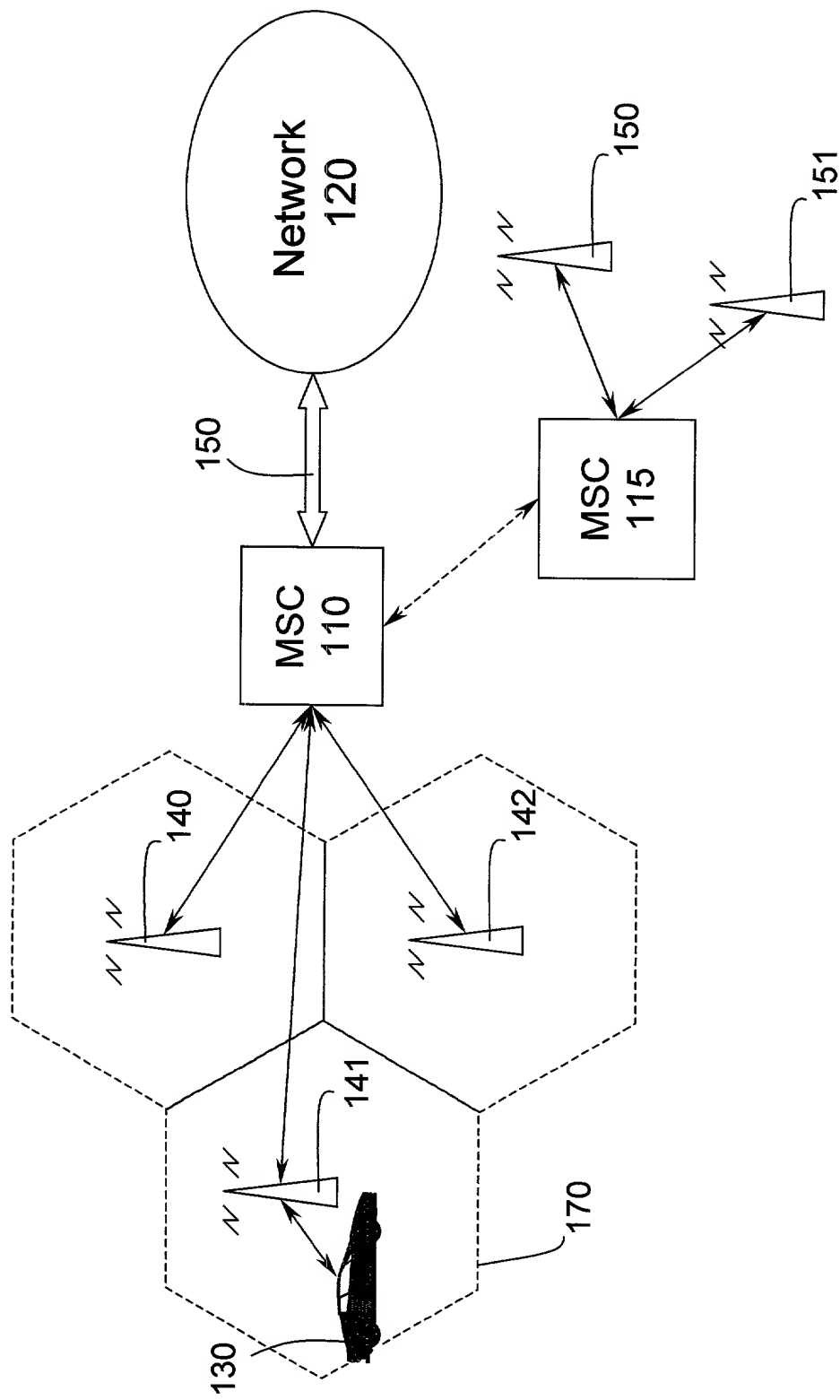


FIG. 1

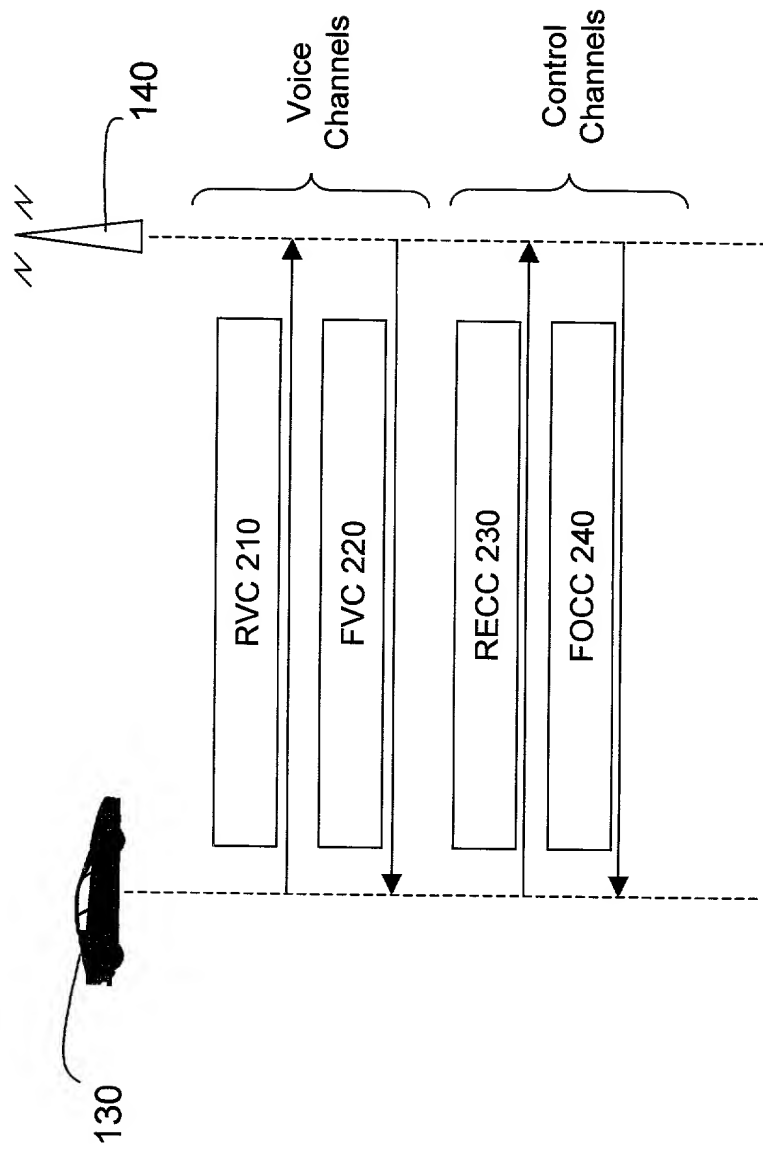


FIG. 2

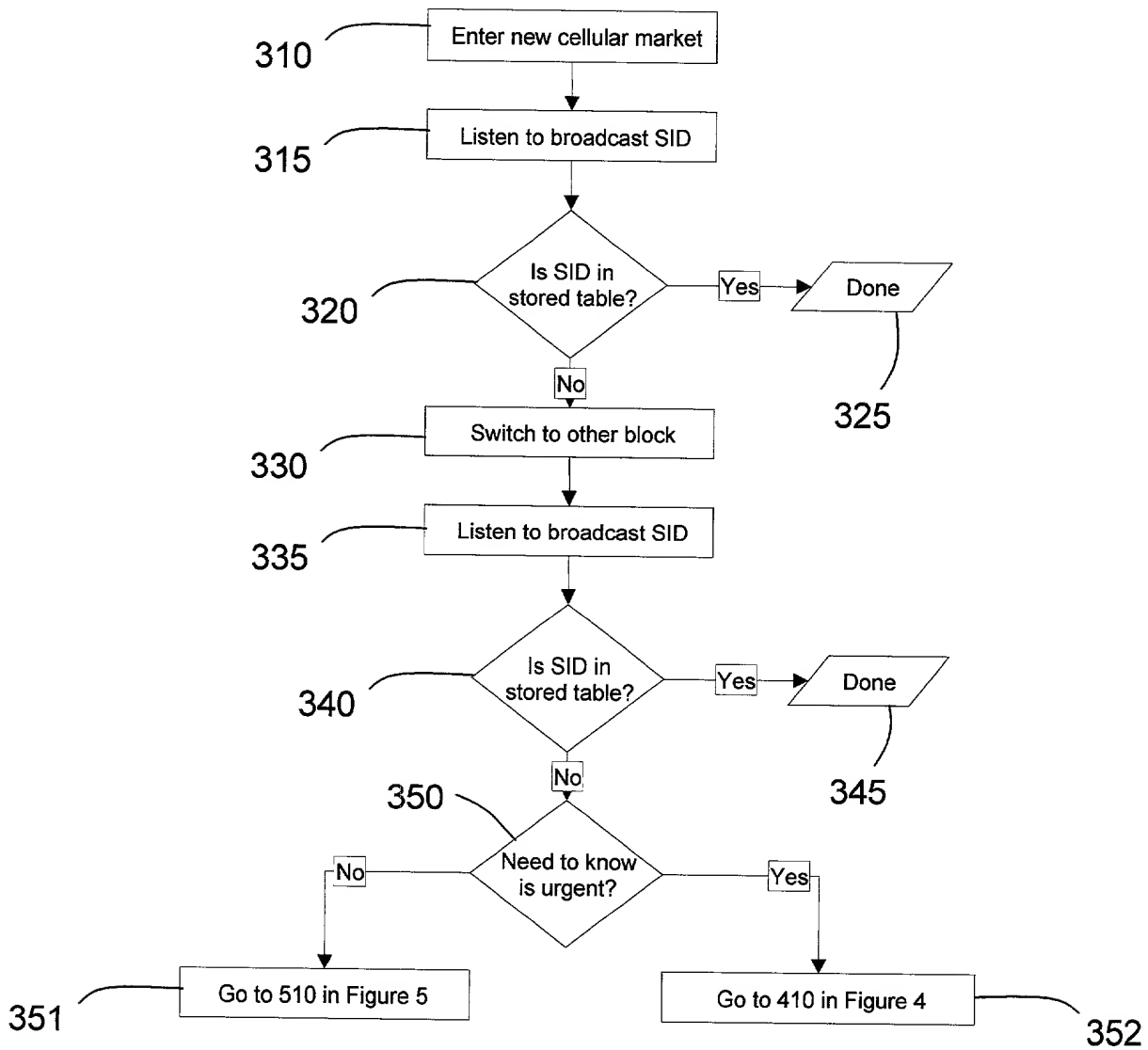


FIG. 3

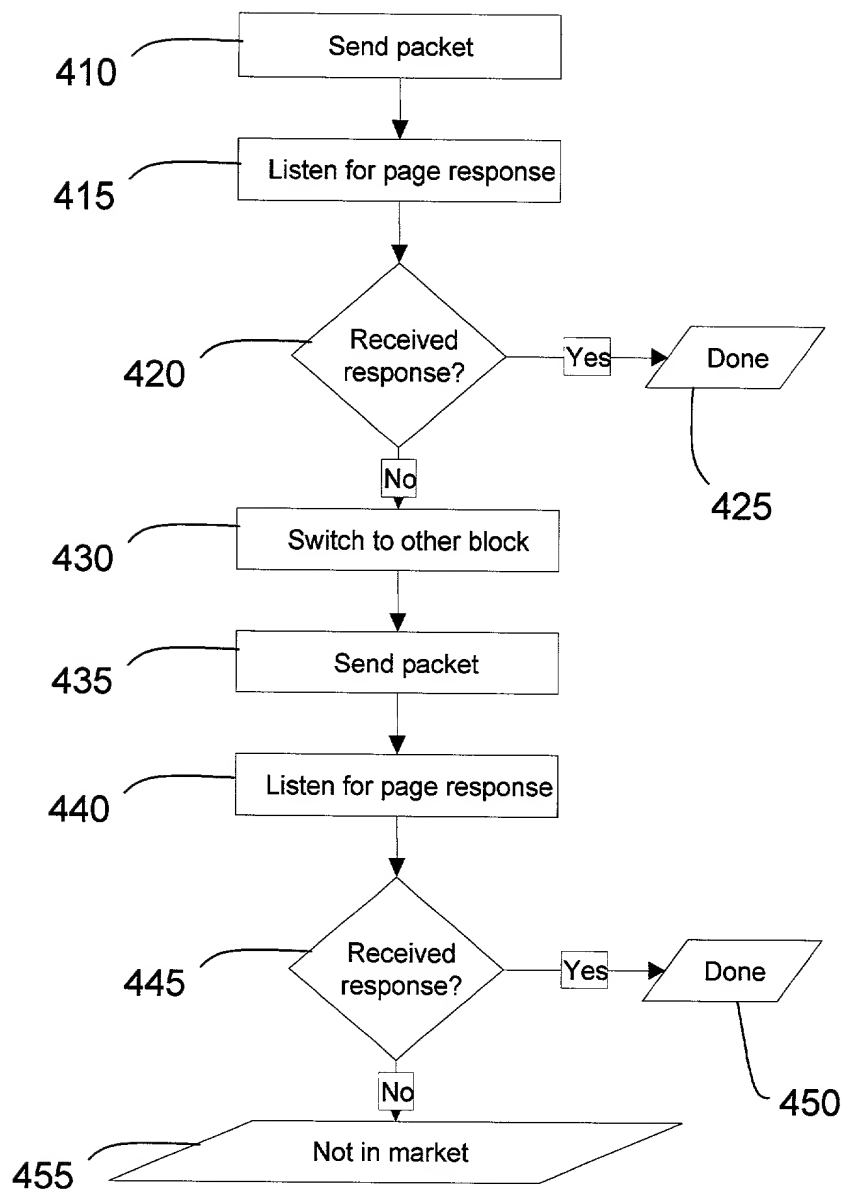


FIG. 4

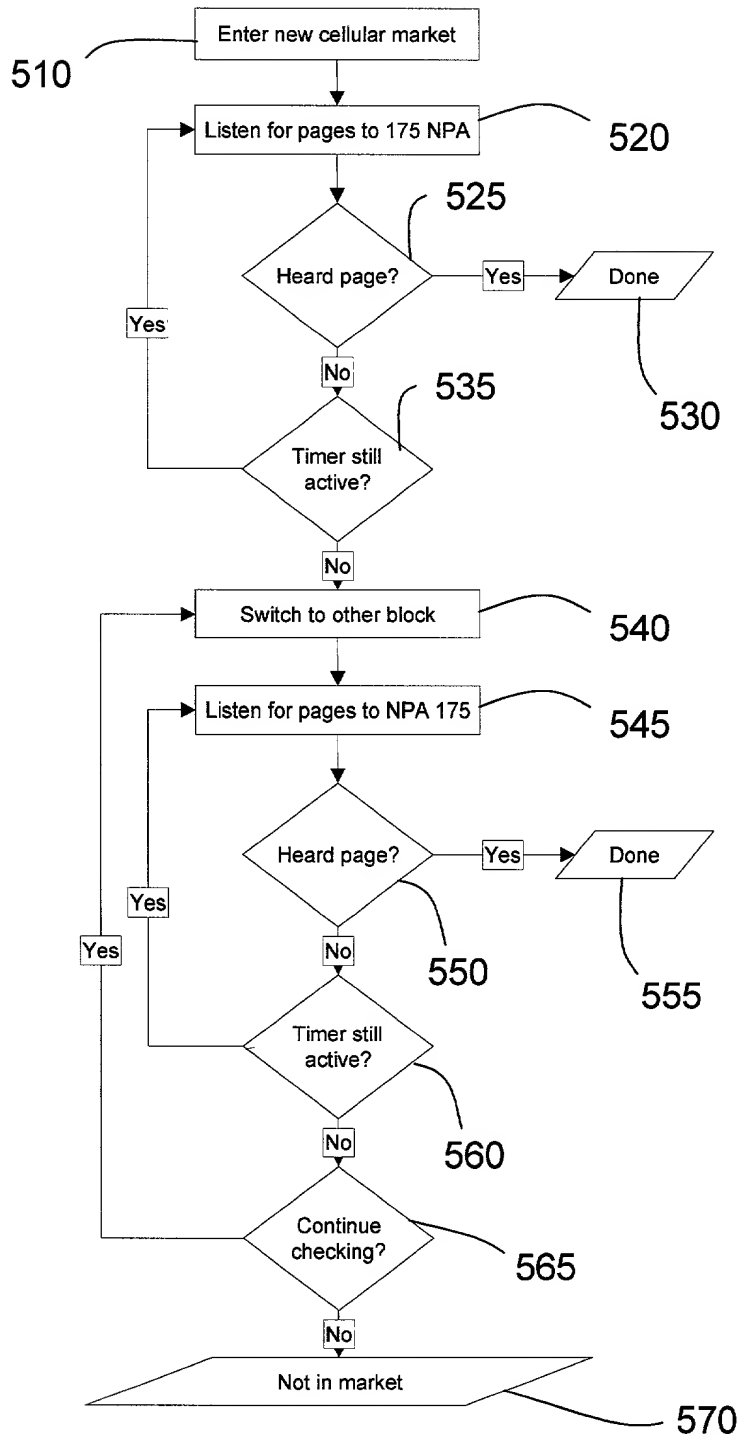


FIG. 5

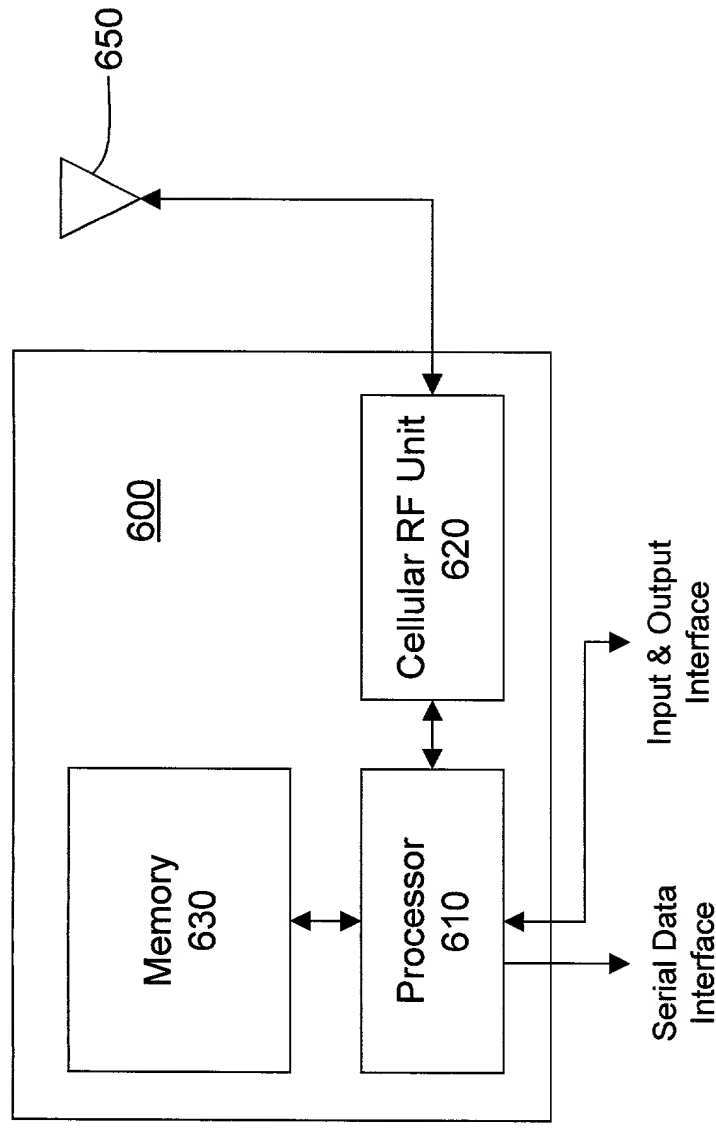


FIG. 6

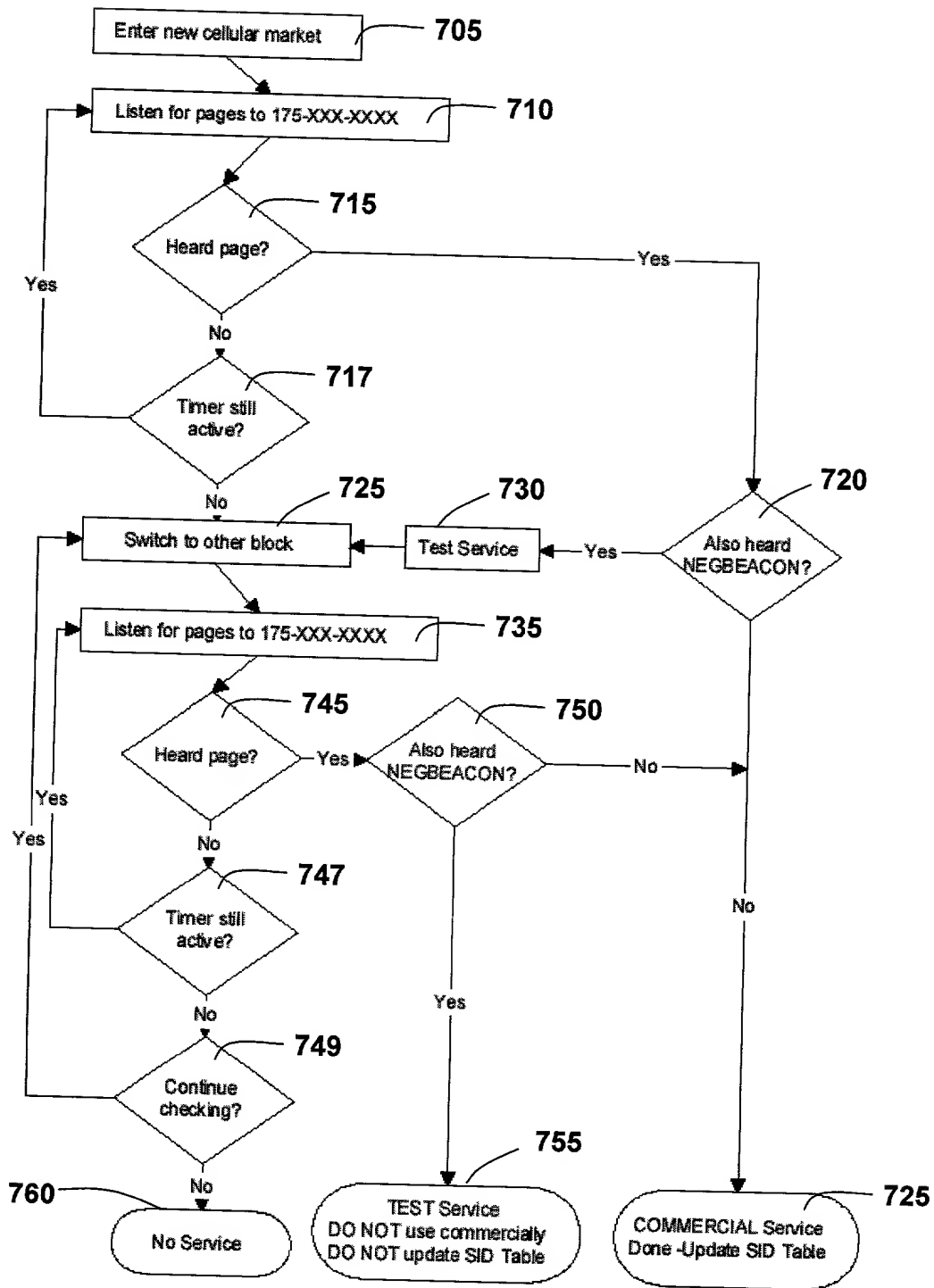


FIG. 7

<i>Coverage Available ON</i>		<i>Response</i>	
A-Block	B-Block	A-Block	B-Block
None	None	None	None
None	Test/Non-commercial	None	NEGBEACON
None	Commercial	None	POSBEACON
Test/Non-commercial	None	NEGBEACON	None
Test/Non-commercial	Test/Non-commercial	NEGBEACON	NEGBEACON
Test/Non-commercial	Commercial	NEGBEACON	POSBEACON
Commercial	None	POSBEACON	None
Commercial	Test/Non-commercial	POSBEACON	NEGBEACON
Commercial	Commercial	POSBEACON	POSBEACON

FIG. 8

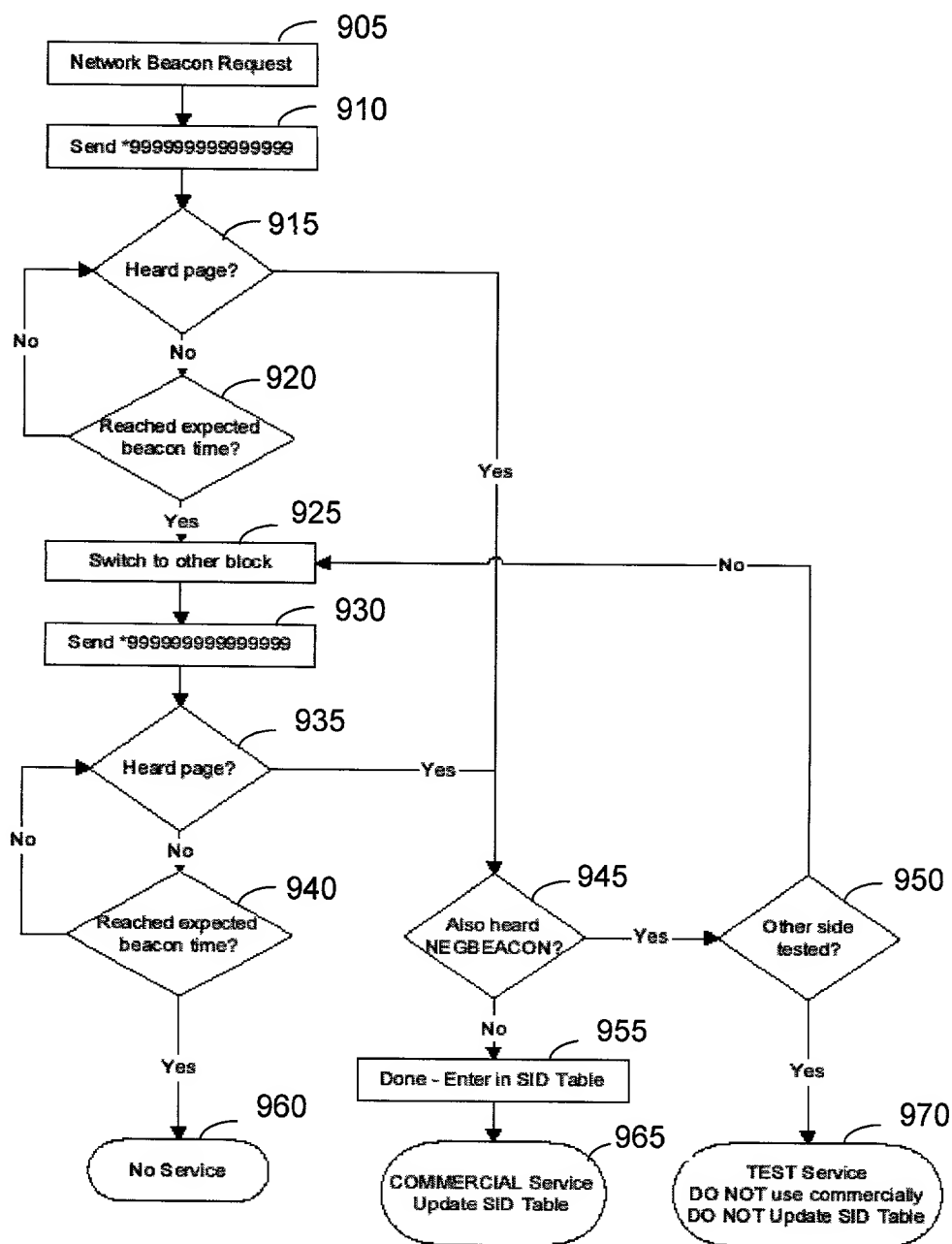


FIG. 9

As a below named inventor, I hereby declare that:

I believe I am the original, first, and sole inventor (if only one name is listed below) or an original, first, and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

the specification of which

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claim(s), as amended by any amendment referred to above. I do not know and do not believe that the claimed invention was ever known or used in the United States of America before my invention thereof, or patented or described in any printed publication in any country before my invention thereof or more than one year prior to this application, that the same was not in public use or on sale in the United States of America more than one year prior to this application, and that the invention has not been patented or made the subject of an inventor's certificate issued before the date of this application in any country foreign to the United States of America on an application filed by me or my legal representatives or assigns more than twelve months (for a utility patent application) or six months (for a design patent application) prior to this application.

I acknowledge the duty to disclose all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d), of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)

Priority
Claimed

<u>(Number)</u>	<u>(Country)</u>	<u>(Day/Month/Year Filed)</u>	<u>Yes</u>	<u>No</u>
<u>(Number)</u>	<u>(Country)</u>	<u>(Day/Month/Year Filed)</u>	<u>Yes</u>	<u>No</u>
<u>(Number)</u>	<u>(Country)</u>	<u>(Day/Month/Year Filed)</u>	<u>Yes</u>	<u>No</u>

I hereby claim the benefit under title 35, United States Code, Section 119(e) of any United States provisional application(s) listed below:

<u>(Application Number)</u>	<u>Filing Date</u>
<u>(Application Number)</u>	<u>Filing Date</u>

I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, Section 112, I acknowledge the duty to disclose all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

<u>09/425,485</u>	<u>October 22, 1999</u>	<u>Pending</u>
<u>(Application Number)</u>	<u>Filing Date</u>	<u>(Status -- patented, pending, abandoned)</u>
<u>(Application Number)</u>	<u>Filing Date</u>	<u>(Status -- patented, pending, abandoned)</u>

I hereby appoint the persons listed on Appendix A hereto (which is incorporated by reference and a part of this document) as my respective patent attorneys and patent agents, with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected herewith.

Send correspondence to Thomas C. Webster, BLAKELY, SOKOLOFF, TAYLOR &
(Name of Attorney or Agent)
ZAFMAN LLP, 12400 Wilshire Boulevard 7th Floor, Los Angeles, California 90025 and direct
telephone calls to Thomas C. Webster, (408) 720-8598.
(Name of Attorney or Agent)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full Name of Sole/First Inventor Syed Zaeem Hosain
Inventor's Signature Syed Zaeem Hosain Date 3/31/2000
Residence San Jose, California Citizenship USA
(City, State) (Country)

Post Office Address 3866 Mars Court
San Jose, California 95121

Full Name of Second/Joint Inventor Robert Fultz
Inventor's Signature Robert Fultz Date 3/28/00
Residence Boulder Creek, California Citizenship USA
(City, State) (Country)

Post Office Address 865 Highland Drive
Boulder Creek, California 95006

Full Name of Third/Joint Inventor James Sotelo
Inventor's Signature James Sotelo Date 2-29-2000
Residence Scotts Valley, California Citizenship USA
(City, State) (Country)

Post Office Address 162 Oak Creek Blvd
Scotts Valley, California 95066

APPENDIX A

William E. Alford, Reg. No. 37,764; Farzad E. Amini, Reg. No. P42,261; Aloysius T. C. AuYeung, Reg. No. 35,432; William Thomas Babbitt, Reg. No. 39,591; Carol F. Barry, Reg. No. 41,600; Jordan Michael Becker, Reg. No. 39,602; Bradley J. Berezna, Reg. No. 33,474; Michael A. Bernadicou, Reg. No. 35,934; Roger W. Blakely, Jr., Reg. No. 25,831; Gregory D. Caldwell, Reg. No. 39,926; Ronald C. Card, Reg. No. P44,587; Thomas M. Coester, Reg. No. 39,637; Stephen M. De Klerk, under 37 C.F.R. § 10.9(b); Michael Anthony DeSanctis, Reg. No. 39,957; Daniel M. De Vos, Reg. No. 37,813; Robert Andrew Diehl, Reg. No. 40,992; Matthew C. Fagan, Reg. No. 37,542; Tarek N. Fahmi, Reg. No. 41,402; James Y. Go, Reg. No. 40,621; James A. Henry, Reg. No. 41,064; Willmore F. Holbrow III, Reg. No. P41,845; Sheryl Sue Holloway, Reg. No. 37,850; George W. Hoover II, Reg. No. 32,992; Eric S. Hyman, Reg. No. 30,139; Dag H. Johansen, Reg. No. 36,172; William W. Kidd, Reg. No. 31,772; Erica W. Kuo, Reg. No. 42,775; Michael J. Mallie, Reg. No. 36,591; Andre L. Marais, under 37 C.F.R. § 10.9(b); Paul A. Mendonsa, Reg. No. 42,879; Darren J. Milliken, Reg. No. 42,004; Lisa A. Norris, Reg. No. P44,976; Chun M. Ng, Reg. No. 36,878; Thien T. Nguyen, Reg. No. 43,835; Thinh V. Nguyen, Reg. No. 42,034; Dennis A. Nicholls, Reg. No. 42,036; Kimberley G. Nobles, Reg. No. 38,255; Daniel E. Ovanezian, Reg. No. 41,236; Babak Redjaian, Reg. No. 42,096; William F. Ryann, Reg. No. 44,313; James H. Salter, Reg. No. 35,668; William W. Schaal, Reg. No. 39,018; James C. Scheller, Reg. No. 31,195; Jeffrey Sam Smith, Reg. No. 39,377; Maria McCormack Sobrino, Reg. No. 31,639; Stanley W. Sokoloff, Reg. No. 25,128; Judith A. Szepesi, Reg. No. 39,393; Vincent P. Tassinari, Reg. No. 42,179; Edwin H. Taylor, Reg. No. 25,129; John F. Travis, Reg. No. 43,203; George G. C. Tseng, Reg. No. 41,355; Joseph A. Twarowski, Reg. No. 42,191; Lester J. Vincent, Reg. No. 31,460; Glenn E. Von Tersch, Reg. No. 41,364; John Patrick Ward, Reg. No. 40,216; Charles T. J. Weigell, Reg. No. 43,398; Kirk D. Williams, Reg. No. 42,229; James M. Wu, Reg. No. P45,241; Steven D. Yates, Reg. No. 42,242; Ben J. Yorks, Reg. No. 33,609; and Norman Zafman, Reg. No. 26,250; my patent attorneys, and Andrew C. Chen, Reg. No. 43,544; Justin M. Dillon, Reg. No. 42,486; Paramita Ghosh, Reg. No. 42,806; and Sang Hui Kim, Reg. No. 40,450; my patent agents, of BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP, with offices located at 12400 Wilshire Boulevard, 7th Floor, Los Angeles, California 90025, telephone (310) 207-3800, and James R. Thein, Reg. No. 31,710, my patent attorney.

APPENDIX B

Title 37, Code of Federal Regulations, Section 1.56 Duty to Disclose Information Material to Patentability

(a) A patent by its very nature is affected with a public interest. The public interest is best served, and the most effective patent examination occurs when, at the time an application is being examined, the Office is aware of and evaluates the teachings of all information material to patentability. Each individual associated with the filing and prosecution of a patent application has a duty of candor and good faith in dealing with the Office, which includes a duty to disclose to the Office all information known to that individual to be material to patentability as defined in this section. The duty to disclose information exists with respect to each pending claim until the claim is cancelled or withdrawn from consideration, or the application becomes abandoned. Information material to the patentability of a claim that is cancelled or withdrawn from consideration need not be submitted if the information is not material to the patentability of any claim remaining under consideration in the application. There is no duty to submit information which is not material to the patentability of any existing claim. The duty to disclose all information known to be material to patentability is deemed to be satisfied if all information known to be material to patentability of any claim issued in a patent was cited by the Office or submitted to the Office in the manner prescribed by §§1.97(b)-(d) and 1.98. However, no patent will be granted on an application in connection with which fraud on the Office was practiced or attempted or the duty of disclosure was violated through bad faith or intentional misconduct. The Office encourages applicants to carefully examine:

- (1) Prior art cited in search reports of a foreign patent office in a counterpart application, and
 - (2) The closest information over which individuals associated with the filing or prosecution of a patent application believe any pending claim patentably defines, to make sure that any material information contained therein is disclosed to the Office.
- (b) Under this section, information is material to patentability when it is not cumulative to information already of record or being made or record in the application, and
- (1) It establishes, by itself or in combination with other information, a prima facie case of unpatentability of a claim; or
 - (2) It refutes, or is inconsistent with, a position the applicant takes in:
 - (i) Opposing an argument of unpatentability relied on by the Office, or
 - (ii) Asserting an argument of patentability.

A prima facie case of unpatentability is established when the information compels a conclusion that a claim is unpatentable under the preponderance of evidence, burden-of-proof standard, giving each term in the claim its broadest reasonable construction consistent with the specification, and before any consideration is given to evidence which may be submitted in an attempt to establish a contrary conclusion of patentability.

(c) Individuals associated with the filing or prosecution of a patent application within the meaning of this section are:

- (1) Each inventor named in the application;
 - (2) Each attorney or agent who prepares or prosecutes the application; and
 - (3) Every other person who is substantively involved in the preparation or prosecution of the application and who is associated with the inventor, with the assignee or with anyone to whom there is an obligation to assign the application.
- (d) Individuals other than the attorney, agent or inventor may comply with this section by disclosing information to the attorney, agent, or inventor.